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Valuing the Early-Stage Company

Valuation in any context is a challenging task, one requiring careful consideration of both the risks and potential rewards of an investment opportunity. When valuing publicly traded assets, this task is aided by a wealth of available information on the firm's business fundamentals and performance, benchmarking data on comparable companies, and typically some consensus about the relevant risks faced by investors and how to measure them. By contrast, when it comes to valuing privately held early-stage companies—companies that are frequently backed by angel investors or venture capitalists—both the available information and the consensus about how to measure risk diminish. Although the foregoing increases the challenge of obtaining plausible valuations for early-stage companies, it by no means lessens the need for valuations. This note briefly discusses several frequently used valuation methods and some of the issues and difficulties encountered when applying them to early-stage companies. In addition, it attempts to provide some direction in making the appropriate tradeoffs between the guidance provided by financial theory and the practical limitations posed by illiquid assets.

Conceptually, the value of an asset is derived from the present value of the future stream of benefits associated with it (e.g., interest, income, cash flow) discounted at a rate reflective of the risk inherent in the stream of benefits. Valuations can be obtained from market comparables or more formally by projecting cash flows for an asset and discounting them to the present at an appropriate risk-adjusted rate. The fact that an asset is privately held does not change the conceptual underpinnings of valuation; however, it does require adjustment of basic valuation methods to reflect the greater uncertainty inherent in young companies. We begin with the venture capital (VC) method and then compare it to the discounted cash flow (DCF) approach. For each, we describe some of the adjustments necessary for the methods to be used in early-stage companies.[1]

Venture Capital Method

The VC method is widely used to value early-stage companies. At its heart is a simplified net present value (NPV) framework stripped of many details associated with the more widely used DCF method. Practitioners often argue that these simplifications are justified by the large amount of uncertainty associated with projecting many of the inputs required for valuation. Others, as we discuss later, argue that the simplifications go too far, leaving practitioners that rely on the VC method open to serious omissions.

[1] *Real options* is another method that is conceptually appealing for valuing early-stage companies. The real option method is compared with other valuation methods, such as the discounted cash flow method, in "Methods of Intellectual Property Valuation" (UVA-F-1401). Also R. Shockley, S. Curtis, J. Jafari, and K. Tibbs, "The Option Value of an Early Stage Biotechnology Investment," *Journal of Applied Corporate Finance* 15, no. 2, (Fall 2002), and T. Luehrman, "Investment Opportunities as Real Options, Getting Started on the Numbers," *Harvard Business Review,* reprint number 98404.

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Venture capitalists frequently present valuations in terms of a *premoney* and *postmoney value*. *Premoney* refers to the value of the company prior to the addition of an investor's capital. *Postmoney* is the premoney value plus the amount of the investor's capital commitment. More generally, the postmoney value is the potential value the enterprise can achieve over its investment horizon with the provision of an investor's funds. The postmoney value is the amount invested in the round *(I)* divided by the percentage (or fraction) of equity an investor obtains in the round *(F)*. These basic two terms interact in a manner illustrated by the formulas below.

Number of new shares purchased	N
Number of shares, warrants, options outstanding	O
Fully diluted shares	SUM(N + O)
Percent of total shares investor purchases	F = N ÷ SUM(N + O)
Amount invested in this round	I
Post-money valuation	POST = I ÷ F
Pre-money valuation	PRE = POST − I

The VC method usually begins with investors estimating how much they plan to invest in the round. The amount invested usually comes from an analysis of the firm's financial situation and an assessment of the funds necessary to take the firm to the "next stage." Often the funds advanced in the round are predicated on the firm reaching certain milestones. Based on the formula above it appears that the postmoney value is derived from the funds going into the enterprise. This appears to belie the usual notion that value is derived from the cash received from the firm at some future point in time (cash in) *in relation to* the cash invested in the firm today (cash out). Underlying the VC method, however, is a conceptual link between cash in and cash out. To see the link, investors must forecast an entity's exit value over the planned investment horizon. As shown below, their percentage equity ownership determines their realizations of cash from the investment.

Today	→	**Exit (***T* years later)
Amount invested		Exit value of firm's equity
		× investors' equity stake %
		= Cash received upon exit
(– Cash out)		(+ Cash in)

A key question remains: How do investors determine what percentage ownership they seek (*F*), in exchange for the funds they provide? To determine their equity stake, investors must also know what return they hope to achieve on their investment. This rate of return is known as the *target rate*.[2] **Exhibit 1** reports the common target rates and horizon periods of private equity investors by stage of investment. In general, the less developed the enterprise, and the longer the horizon to exit, the higher the target rates. For the sake of argument, let's assume in our example that investors have a target rate of 50%. While the merits of this can be debated, the VC method generally disregards all interim cash flows, so that an investment is evaluated based on the amount to be received *t* periods later, or its terminal value (TV), in relation to the money invested today. Let's assume an investor is contemplating investing $1.5 million today and foresees five years from today an exit of $50 million.

[2] Be careful to distinguish the concept of a target rate from that of an expected or required rate of return. The target rate is the return an investor hopes to achieve in the best outcome. The expected return is the return an investor is likely to achieve factoring in the probability that things do not always work as planned.

Figure 1. Illustration of the VC method.

Target rate	50%					
Years to exit	0	1	2	3	4	5
($ in millions)	←					→
Investment cash flows	($1.5)	0	0	0	0	$50.0
PV of exit value	**$6.58**					
Ownership stake (%)	22.78%					
FV of amount invested						$11.39

Source: All tables and figures, unless otherwise noted, were created by author.

In **Figure 1**, the present value (PV) of the exit value, $6.58 million, is found by discounting $50 million at 50% per period for five periods ($50 million ÷ 1.50^5 = $6.58 million). The ratio of $1.5 million invested today divided by the PV of the exit value gives *F*, the percentage ownership stake an investor must negotiate to achieve a 50% target return. The PV of the exit value is referred to as the *postmoney value* of the enterprise, or the potential value today the enterprise can achieve *given* the infusion of funds. The *premoney value* is simply $6.58 million – $1.5 million = $5.08 million.

There is an equivalence, however, between present value and future value, and one can approach the problem by focusing on the future point of exit. In this case, we can determine the future value (FV) of $1.5 million invested today at 50% per year for five years, or $11.39 million ($1.5 million × 1.50^5 = $11.39 million). If venture capitalists anticipate exiting this investment at $50 million in five years, then an investor needs to realize $11.39 million in order to achieve a 50% return per annum. Therefore, a VC needs to own 22.78% of the firm's equity at the time of exit to achieve this return ($50 million × 22.78% = $11.39 million). Given the importance attached to the postmoney value in negotiations, however, it is more usual to calculate the postmoney value using present value.[3]

Number of Shares and Price per Share

So far, we have not said anything about the number of shares or price of the equity shares. There is a reason for that—for the most part, the number of shares and the price per share are fungible. They are often determined after a postmoney value and a percentage equity stake are established. By analogy, one might think of the example of a stock split. The price and number of shares are of less importance than the overall value they equal. Nonetheless, it is useful to consider how the number of shares and price per share are determined because ultimately those values must be entered on the term sheet and stock purchase agreement for the round. Let's assume in our example that the firm had 500,000 shares outstanding prior to this round's investment (held by the founders and seed round investors).[4] We know from our prior example that investors wished to achieve a 22.78% equity stake. Therefore, the number of new shares, *N,* can be found as follows:

$$New\ Shares\ \ (N) = \frac{N}{(N + 500{,}000)} = 0.2278$$

[3] All else equal, it should make sense that if investors increase their investment to say $2 million that the required ownership stake will increase from 22.8% to 30.4%. It will take a higher percentage of the firm's equity at exit to realize the 50% return.

[4] Founders' shares are shares of common equity as opposed to preferred shares

Solving for *N* yields 147,501 new shares, which, when added to the founders' shares, results in 647,501 total shares outstanding following the round.

Alternatively, if the percentage of equity has been negotiated in the round, the number of new shares can be calculated as the number of outstanding shares before the round × *[F ÷ (1 − F)]*. This gives 500,000 × [0.2278 ÷ (1 − 0.2278)] = 147,501 new shares.

The price per share can now be determined several ways.

- Based on the postmoney value, $6.58 million ÷ 647,501 = $10.17 per share.
- Based on the premoney value, $5.08 million ÷ 500,000 = $10.17 per share.
- Based on the amount invested, $1.50 million ÷ 147,501 = $10.17 per share.

It goes without saying that the per-share price must be the same in all three cases.

A $10 per-share price probably falls outside the norm that investors have for a first-round investment. As we noted earlier, the number of shares and prices are fungible, and in this case, the firm will likely undergo a "mini-recap" wherein the number of founder shares will be increased and the new shares adjusted accordingly to result in a lower per-share price for the round. From a valuation viewpoint, such adjustments are cosmetic.

Option Pools

In negotiating the terms of the round, the parties should also consider a third constituency, the firm's employees. The entrepreneur and investors will likely agree upon the importance of reserving a pool of shares for future use as an employee incentive, both to augment compensation or to hire and retain highly talented workers.

Investors and the entrepreneur should reach an understanding up front about how large the option pool should be and how the share reserve pool will be incorporated into the valuation. Using the above example, we can see the importance of this determination. Suppose the *preclose* valuation is set at $6.58 million, and 250,000 shares have been allocated to the share reserve pool that have not yet been granted to employees. Investors should seek to include the reserved shares in the number of shares outstanding, reasoning that at some point, the shares are likely to be granted to employees. Therefore, they will argue that a total of 750,000 shares rather than 500,000 shares are previously outstanding. Since investors are bargaining for 22.78% of the company, their share allocation should be 221,251 (versus 147,501) shares, which would result in 971,251 (versus 647,501) shares outstanding after the close of the deal. Since more new shares are issued, the price per share falls from $10.17 to $6.78 ($6.58 million ÷ 971,251), but since investors own 221,251 shares, their investment is still worth $1.5 million (ignoring rounding).

It is better from the entrepreneur's viewpoint, however, to have the ungranted shares excluded from the reserve pool in the valuation. If the entrepreneur is successful, investors will still receive 147,501 shares as originally calculated. As the reserved shares are granted to employees, they will dilute the value of the investors' shares. The fully diluted price per share is still $6.78, but investors would hold only 147,501 shares. Therefore, the value of their investment would be worth $1.0 million instead of $1.5 million. In this circumstance, investors actually purchase 15.2% of the company (147,501 ÷ 971,251 = 15.2%) rather than the 22.8% they originally sought.

The treatment of the share reserve pool not only affects the price per share and the value of the investment, but also the control rights of the deal. Credible governance mechanisms help to maintain the value of an investment by providing investors with monitoring capabilities that can be used to discourage misbehavior by the entrepreneur. The strength of those governance and monitoring provisions often depends on the percentage of ownership and control rights investors possess. Therefore, for a number of reasons, investors should be mindful of the treatment of reserve pools in negotiating the terms of the deal.

Discounted Cash Flow Method

The DCF approach typically attempts to determine the value of the company (or enterprise) by establishing the NPV of cash flows over the life of the company.[5] Since a corporation is assumed to have infinite life, the analysis is typically broken into a forecast period and a TV, depicted as follows.

VALUE (V) = PV(FCFs in Forecast Period)
+ PV(FCFs after Forecast Period)

In the forecast period, explicit projections of free cash flow (FCF) that incorporate the economic benefits and costs of the firm must be developed. Ideally, the forecast period should cover the interval in which the firm enjoys a competitive advantage (i.e., the period where expected returns exceed required returns). More often than not, 5- or 10-year forecast periods are used in lieu of careful thinking about the subject. The value of the company arising after the forecast period is captured by TV. TV is usually placed in the last year of the forecast period and capitalizes the present value of all future cash flows beyond the forecast period. Often the terminal region cash flows are projected under a steady-state assumption that assumes the firm experiences no abnormal growth or that the expected returns equal the required returns after the forecast period.

Once a schedule of FCFs is developed for the enterprise, the weighted-average cost of capital (WACC) is used to discount them to the present. Since few start-up firms make extensive use of debt financing, the WACC is usually based on the company's equity cost of capital. The present value of those cash flows provides an estimate of ongoing company or enterprise value.

In contrast to the target rate used in the VC method, the WACC used in the DCF method represents the opportunity cost or required return on investments of similar risk to the enterprise in question.

Free Cash Flows

The inputs to FCF are usually derived from the company's financial statements. FCFs developed from even the simplest income statement (**Figure 2**) require assumptions about the level and growth rate of revenues, production costs (COGS), and marketing expenses (SG&A). In addition, estimates about the sustainability of operating margins and the amount of capital expenditures upon which depreciation depends need to be formulated. Such forecasts are difficult to make for mature companies, and much more so for start-up companies. Nonetheless, these projections are at the heart of any business plan, and their reasonableness is often the basis upon which investors make their judgment of an entrepreneur's understanding of the business and marketplace realities.

[5] One can value the enterprise or the equity of the enterprise, but this note focuses on valuing the company as a whole (the enterprise). When valuing the equity, residual cash flows are used, which come after interest payments and debt repayments. One must discount residual cash flows at the cost of equity.

Figure 2. Income statement.

Sales
– Cost of goods sold (COGS)
– Selling and administrative expenses (SG&A)
Earnings before interest and taxes (EBIT)
– Interest expense
Taxable income
– Taxes
Net income (NI)

FCFs should be operating cash flows attributable to the company, but excluding financing charges. Generally, cash flow will be the sum of after-tax earnings, plus depreciation and noncash charges, less investment. From an enterprise valuation standpoint, earnings must be the earnings after taxes available to all providers of capital or net operating profits after taxes (NOPAT). Cash flows should include the expected synergies (cost savings, growth opportunities, etc.) of owning the firm in question. The inputs to FCF are as follows:

EBIT $(1 - T)$	=	NOPAT
+ Depreciation	=	Noncash operating charges including depreciation, depletion, and amortization recognized for tax purposes
− Capital expenditures	=	Addition of long-lived capital assets during year (net of dispositions)
− ΔNet working capital (NWC)	=	Increase in NWC, defined as current assets less non-interest-bearing current liabilities.

The cash flows must also be *expected cash flows*, meaning they reflect the level of performance that is most likely for the firm and not the best or worst cases possible. By comparison, the VC method assumes a *success* or *best-case* cash flow scenario—which forecasts that entrepreneurs will achieve the projected cash flows with 100% success. While this assumption seems highly questionable, venture capitalists regularly contend that it's often useful to grant entrepreneurs their forecasts and see if the investment can meet their target return. If it doesn't pass the first test, there is little reason to go forward. The type of cash flow used is a key distinction between the methods.

To determine the expected FCF, best-case FCF projections must incorporate a high probability of enterprise failure for an early-stage company. Research suggests that 50% to 60% of all start-ups fail within four years of their founding. The expected FCF_t is given as:

$$E(FCF_t) = \text{Best-Case } FCF_t \times (1 - \text{Probability of Failure}).$$

In portfolio theory, enterprise or project failure is referred to as diversifiable or unique risk. Across a portfolio containing several investments in early-stage companies, diversifiable risk is reduced until the risk of the portfolio comprises largely nondiversifiable or systematic risk. For diversified private equity investors, which would include most categories of limited partners (e.g., pension funds, insurance companies, endowments, or high-net-worth individuals), the discount rate used in the DCF method is based on the systematic risk or beta of the enterprise determined by an asset pricing model such as the Capital Asset Pricing Model (CAPM). Note that this does not mean that unique risk is unimportant. Rather, under the DCF method, the cash flows are adjusted directly for the possibility of enterprise failure or unique risk.[6]

[6] The greater the percentage of an entrepreneur's wealth that is invested in the company, the higher his or her opportunity cost or discount rate will be in relation to that of investors. Leaving aside differences in future performance expectations for the firm, the difference in risk between entrepreneurs

The DCF approach cannot eliminate the need to make difficult forecasts, but it can take account of several circumstances that frequently arise with early-stage companies. First, *by including all interim FCFs over the forecast period*, the method captures the value associated with the fact that early-stage companies frequently lose money in their first several years in business. Second, it includes capital expenditures and the purchase of other long-lived assets. These items are *not* included in COGS or operating expenses, which are annual or short-term expenses. These expenditures can have pronounced effects on both the funding requirements and the viability of early-stage enterprises. Third, it can address the problems of high (or varying) growth rates and uncertainty in a straightforward manner through the use of probability-weighted scenarios. The DCF method, if properly employed, allows an investor to more fully account for the uniqueness of the company's situation than the VC method. After all, it is the uniqueness of the company and its particular circumstances upon which success in private equity depends.

Terminal Value

To capture the longevity of the cash flows, the DCF method typically uses a TV at the end of the forecast period to value the cash flows beyond that point. As a base case, TV is typically estimated using a constant-growth-rate perpetuity:

$$TV_N = \frac{FCF_N \times (1 + g)}{WACC - g}$$

TV_N = Terminal value in year N that values cash flows beyond year N

FCF_N = Free cash flow for year N

g = Long-term sustainable growth rate of cash flows—normally equal to the inflation rate plus 1% to 2% real growth.

WACC = A discount rate that reflects the risk of the cash flows. Since early-stage companies are private and have little or no debt, the appropriate rate is based on the beta coefficients from comparable publicly held companies.

If carefully applied, a growing perpetuity can provide a reasonable estimate of TV for established companies, but it is generally not appropriate to assume a single steady-state growth rate for an early-stage company. Consequently, market multiples or comparable transactions are typically used for the base-case TV estimate under both the VC and DCF methods of valuation in lieu of a growing perpetuity.

and investors is one reason why valuations can differ so markedly between the parties. One paper estimates the cost of capital for venture capital investors and entrepreneurs in high-tech initial public offerings (IPOs). It reports for the sample average a 16.7% cost of capital before management fees and carried interest for a well-diversified investor. By comparison, an entrepreneur with 25% of his or her wealth invested in the venture and 75% in a diversified market portfolio is estimated to have a cost of capital of 40%. See Frank Kerins, Janet Kilholm Smith, and Richard Smith, "Opportunity Cost of Capital for Venture Capital Investors and Entrepreneurs," *Journal of Financial and Quantitative Analysis* 39, no. 2, (June 2004).

Some frequently used multiples are evaluated in **Figure 3** for a typical company included in Standard and Poor's (S&P) Small Cap 600 Index. The publicly traded companies that make up the index are generally larger in size, and more transparent and liquid than private companies. For these reasons, the public company valuation multiples are reduced by a 30% liquidity discount because several studies find that investors are willing to pay more for transparent and liquid companies than for private companies.[7] Although there is always an element of judgment about the size of the discount, 30% is a reasonable composite across studies. The discount can vary by industry and the length of time an investor must wait before a private asset can be sold. Under Rule 144 (the legal basis for defining privately held assets), before 1997, an investor had to hold a private asset for at least two years before it could be sold. After 1997, the holding period was reduced to one year, and later to six months. These have resulted in a lower liquidity discount over time. Because the holding periods and degree of illiquidity for early-stage investments are typically much greater than those for Rule 144 assets, a 30% discount is used in the absence of more detailed information about the assets being valued.[8]

Assuming a five-year exit horizon and that the value of the firm is based only on the TV (something that violates the assumptions of the DCF method), **Figure 3** shows the comparative postmoney valuations derived from alternative valuations approaches.

Figure 3. Comparative postmoney valuations.

	DCF Method	DCF Method	VC Method	VC Method	VC Method
($ in millions)					
Inputs:					
Discount or target rate (%)	17%	17%	50%	50%	50%
Terminal value approch	Perpetuity	Multiple	Multiple	Multiple	Multiple
Numerator (CF item)	Free cash flow	Enterprise value	Enterprise value	Enterprise value	Market capitalization
Denominator	(WACC – *g*)	EBITDA	EBITDA	Sales	Net income
Terminal year cash flow	$80	$165	$165	$960	$91
Valuation multiples		10.9×	10.9×	1.9×	20.3×
Less: liquidity discount (1–30%)	–	×0.7	×0.7	×0.7	×0.7
Multiple applied	–	**7.6×**	**7.6×**	**1.3×**	**14.2×**
TV	$640	$1,259	$1,259	$1,277	$1,293
PV of TV	$292	$574	$166	$168	$170
Less: probability of failure 50%	$146	$287	–	–	–
Postmoney value	**$146**	**$287**	**$166**	**$168**	**$170**

There are two important points to note in the figure. First, under the DCF method, a 17% discount rate is used in the valuation, which is based on the CAPM.[9] This rate adjusts for systematic risk but not for unique risk, and therefore, the PV of the TV is reduced by an assumed 50% probability of failure. In practice, the

[7] Two studies attempt to more rigorously estimate the size of the liquidity discount by comparing publicly traded firm valuation to private firm valuation for a sample of firms in the same industry over the same period of time. J. Koeplin, A. Sarin, and A. Shapiro, "The Private Company Discount," *Journal of Applied Corporate Finance* 12, (Winter 2000): 94–101 reports a 30% liquidity discount for a sample of firms from 1984–98. S. Block, "The Liquidity Discount in Valuing Privately Owned Companies," *Journal of Applied Corporate Finance,* (Fall/Winter 2007): 33–40 finds an average discount of 20% to 25% for a sample of firms between 1999 and 2006.

[8] Finer distinctions can be about the size of the liquidity discount if, for example, the assets have a well-defined secondary market value (e.g., jet aircraft or rental cars). Early-stage companies, however, often have unique assets for which there are few benchmarks to judge their value, and for these, the 30% discount provides a baseline estimate based on existing research. As firms mature and grow larger, however, the liquidity discount is often reduced or eliminated.

[9] The 17% WACC (assuming all-equity financing) is based on a beta from peer companies of 2.0, a risk-free rate of 5%, and a market risk premium of 6%. A 4% growth rate is also assumed for the growing perpetuity used to estimate terminal value.

appropriate adjustment for failure comes from investors' experience about the inability of young companies to live up to expectations or market data about their mortality. Note that the 50% adjustment for probability of failure occurs regardless of whether the TV was based on a growing perpetuity or a market multiple. In the other cases, a 50% target rate is used under the VC method. This rate adjusts for unique, systematic, and other unspecified risks, and because success-scenario cash flows are assumed, there is no further adjustment for the probability of failure. Second, the growing perpetuity provides the lowest TV, most likely because the assumed growth rate of 4% is less than the embedded growth rates of the other multiples. The range in postmoney values illustrates how the differing assumptions of the methods and TVs can alter the valuation placed on the firm.

Although multiples are widely used in private equity, there are several caveats that accompany their use.

- Multiples require careful research to find other firms comparable to the target company. Finding the right comparables is one of the biggest challenges for start-up companies. Many analysts begin by matching the target company to peers based on a four-digit standard industrial classification (SIC) code. While that approach provides a first cut, it may not yield a sufficient number of peers, or it can miss good peers that are somewhat more diversified in their revenue sources than the target firm. Having identified a peer group, the closest comparables will be those of similar size or those that have a similar business model to the target. Market capitalization or the level of sales is often used as the basis for judging comparable size.

- The multiple used to compute TV should be the expected multiple at the time of exit. But how often is the current multiple likely to be a good guide to the future multiple at the time of exit? **Exhibit 2** summarizes the historical price–earnings (P/E) ratios for the S&P 500 Stock Index from 1878 to 2015. Although the S&P 500 represents much larger firms than the typical early-stage company, it has a long history over which valuation can be gauged. Multiples, like equity prices in general, have a tendency to exhibit *regression toward the mean*. This can be seen in **Exhibit 2** where high (low) P/E ratios have a tendency to decrease (increase) toward to the historic P/E ratio of 16.6. Whether due to behavioral biases or the self-correcting mechanism of markets, as prices and therefore multiples go higher, capital flows into those assets increase, which eventually drives down returns, reducing capital inflows, and thereby decreasing prices. As a result, investors buying at high multiples are more likely to experience a lower multiple at exit-especially if the exit occurs several years later. For example, if a P/E ratio of 44 had been used to estimate the TV in 2000, it would overestimate the TV that would likely prevail in 2005, when P/E ratios had fallen to roughly 25. Although the phenomenon that investors overpay for growth (or, conversely, underpay for the mundane) is widely documented, the speed and degree to which prices revert to the mean is not easily predicted.

- Research also has documented that investments made during times of high valuation tend to underperform for several reasons. First, as seen in **Exhibit 3**, more capital flows into VC during periods of high market valuation as measured by the P/E ratio of the NASDAQ composite. As a result, there is greater competition for deals during these periods and prices rise, subsequently making it harder to achieve high returns. Compare, for example, the years 1991 and 2000. In 1991, the NASDAQ had a relatively low P/E ratio (18), and a low amount of capital was raised, but the funds invested that year produced an IRR of 27.9%. In 2000, the P/E ratio reached a peak of 60, which led to an astonishing amount of capital being raised, and a relatively poor IRR of 0.9%. Second, for unknown reasons, during hot markets, investors become more accepting of risk than during cold markets, which enables, all else being equal, lower-quality firms to receive funding, and these firms subsequently disappoint investors.

Through experience and training, investors learn to watch for signs of overvaluation and build appropriate downside scenarios into the valuation to guard against overly optimistic estimates of TV. Likewise, investing in times of relatively low market valuation can provide for multiple expansion based on market movements alone.

Adjusting for Multiple Rounds of Financing

Early-stage companies are capital-intensive by nature, and it typically takes four to five rounds of investment to reach the point of a sale or IPO exit.[10] Unless investors continue to invest on a pro rata basis in successive rounds, dilution of their equity stakes (a loss of ownership due to the issuance of additional shares) is likely to occur. While legal tools such as antidilution provisions and liquidation preferences provide investors some defense against dilution, venture capitalists still see dilution as their "greatest enemy."[11]

Some notion of the potential effects of dilution can be gleaned from the number of rounds and percentage of equity sold in successive rounds of financing. **Figure 4** shows the median premoney valuations and percentages of equity sold in VC financings that occurred over 2009 to September 2013.[12] Notice as the rounds continue, the median premoney valuations increase and percentage of the company sold in each round decreases. Between 2009 and 2013, the median Series A round was approximately 30%, the median Series B round was 25%, and the median Series C round was 20%. The equity percentages decrease because earlier rounds are more "more expensive" to entrepreneurs because venture capitalists bear more risk in these rounds (target rates are higher) and, for a given amount of funding, investors demand a higher percentage of equity.

Figure 4. Median premoney valuations and equity percentages sold by round.

	2009	2010	2011	2012	2013*
	Median Premoney Valuation ($ in millions)				
Series Seed	-	$3.2	$4.1	$4.4	$5.2
Series A	$6.6	$6.8	$7.8	$8.7	$8.9
Series B	$18.2	$21.1	$22.4	$24.9	$25.7
Series C	$30.2	$36.4	$49.8	$51.2	$58.2
Series D or Later	$52.9	$73.7	$89.3	$92.1	$114.0
	% Equity Acquired				
Series Seed	-	24%	22%	23%	23%
Series A	34%	30%	27%	27%	29%
Series B	27%	27%	24%	23%	23%
Series C	23%	19%	20%	18%	18%
Series D or Later	14%	16%	13%	16%	13%

*As of September 30, 2013.

Data source: Pitchbook Venture Capital Valuation and Trends, Q4 2014.

Let's return to our previous example in **Figure 1** where a first-round (Series A) investor was considering a $1.5 million investment in a company whose TV was expected to be $50 million in five years. In the absence of considering the effects of additional rounds of financing, that analysis showed a Series A investor would need to own 22.78% of the firm's equity at the time of exit to achieve a 50% return per annum. The Series A round investors, however, should anticipate additional rounds of financing, and therefore negotiate a higher stake to account for this dilution in order to be left with 22.78% of the equity at exit.

[10] Susan Chaplinsky and Swasti Gupta-Mukherjee, "Investment Risk Allocation and the Venture Capital Exit Market," Darden School working paper, October 2015.

[11] Justin J. Camp. *Venture Capital Due Diligence: A Guide to Making Smart Investment Choices and Increasing Your Portfolio Returns.* (NY: John Wiley & Sons, Inc., 2002), 108. For a discussion of the legal terms employed in term sheets, see Susan Chaplinsky, "Early-Stage Term Sheets," UVA-F-1730 (Charlottesville, VA: Darden Business Publishing, 2015).

[12] PitchBook Venture Capital Valuations & Trends, Q4 2013.

To capture the effects of multiple rounds of financing, we calculate the cumulative share of equity sold after round *i* until the time of exit. Assume that, following the $1.5 million Series A round of financing, a Series B and C round will follow, after which the firm will be exited. If we assume that the percentages of ownership sold in those rounds roughly conform to the medians reported in **Figure 4** (i.e., Series B = 25% and Series C = 20%), then cumulatively, 45% of the company is sold to the Series B and C round investors. Under the assumption that the Series A round investors do not invest in the subsequent rounds, the cumulative share of the company sold to other investors will significantly dilute their equity stake. The *retention ratio* for the round *i* is:

$$\text{Retention Ratio}_i = 1 - \text{Cumulative share of equity sold in future rounds after round } i$$

The retention ratio is the percentage of equity that all prior-round investors retain after the additional rounds of financing are completed.

In this case, the retention ratio for the Series A round investors is 55.0% (= 1 − 25.0% − 20.0%). With this information, we can adjust the initial Series A round stake to find the currently required stake that accounts for the anticipated effects of this dilution (Series A_{B+C}).

$$\text{Dilution-adjusted Series } A_{B+C}\ (\%) = 22.78\% \div 0.55 = 41.42\%$$

Accordingly, if the Series A investors negotiate an initial stake of 41.42%, after the completion of the Series B and C rounds they would be left with 22.78% of the equity at exit [41.42% × 55.0% = 22.78%], the amount needed at exit to achieve a 50% return.[13]

Of necessity, this analysis has simplified a number of issues to account for the effects of dilution. In reality, early-round investors (and most especially the founders!) must

1. estimate the number, timing, size, and target rates of investors for the successive rounds of financing that the company will undertake; and
2. estimate the required final ownership percentages that
   i. they and other subsequent investors in those rounds will likely demand;
   ii. future management and key employees will be granted; and
   iii. the ownership percentage (if any) that will be sold in an IPO.[14]

Although investors expect their investment to increase in value in each successive round, founders must anticipate that they will likely experience some dilution with each successive round. Thus their primary "consideration should be to what extent any current round, and the dilution it involves, will generate a rise in the long-term value of their holdings."[15] That said, investors should consider that at some point, founders may need to be compensated with additional equity to maintain their incentives. Even in a successful company that exits through an IPO, after multiple rounds, founders can be left with too small a percentage of equity to drive value creation. It is in investors' interests to see that the founders are properly incented.

[13] Because a Series C round of 20% follows Series B, Series B investors will also have to adjust their stakes to realize their target return. Dilution-adjusted Series B_{+C} (%)= Initial Series B (%) ÷ (1 − 20%). No adjustment is necessary for Series C, because no rounds are expected after it.

[14] Camp, 220–2. To the extent these percentages are known, they can be factored into the calculation of the retention ratio to further adjust the Series A ownership stake. For example, the retention ratio could subtract an additional 10% of the equity that might be granted to employees through options by the time the firm is exited.

[15] Fuerst and Uri Geiger, *From Concept to Wall Street.* (Upper Saddle River, NJ: Pearson Education, Inc., 2003), 127.

Accounting for the dilution of subsequent rounds is one of the more challenging aspects of early-stage investing, yet the larger mistake would be for investors to assume that no additional financing will be required. In this case, the early-round investors will undoubtedly end up with insufficient equity to achieve the level of returns they seek.

Summary

Often, practitioners will argue that the level of uncertainty is so pronounced for early-stage companies that formal valuation of the enterprise is a meaningless exercise. Our goal in valuing an early-stage company is not to develop a precise estimate of its value. Rather, valuation serves as a rigorous check on the credibility of our assumptions and knowledge of the company, industry, and market. Because forecast precision is a problem, strategic issues must also be considered carefully. These include realistic assessments of the size of the market and the opportunity, the ease of entry (which is too often assumed to be difficult), and the quality and depth of management. Be wary of the sustainability of barriers to entry created by technology, a common claim of early-stage ventures. Experience suggests that when there is rapid technological innovation, it is possible to be "leapfrogged," and when technological innovation is slow, it is easier for competitors to catch up. By combining a candid assessment of both the financial and strategic strengths and weaknesses of the company, investors can successfully deal with the uncertainty of early-stage investments.

Exhibit 1

Valuing the Early-Stage Company

Target Rates of Return (ROR) Sought by Venture Capital Investors

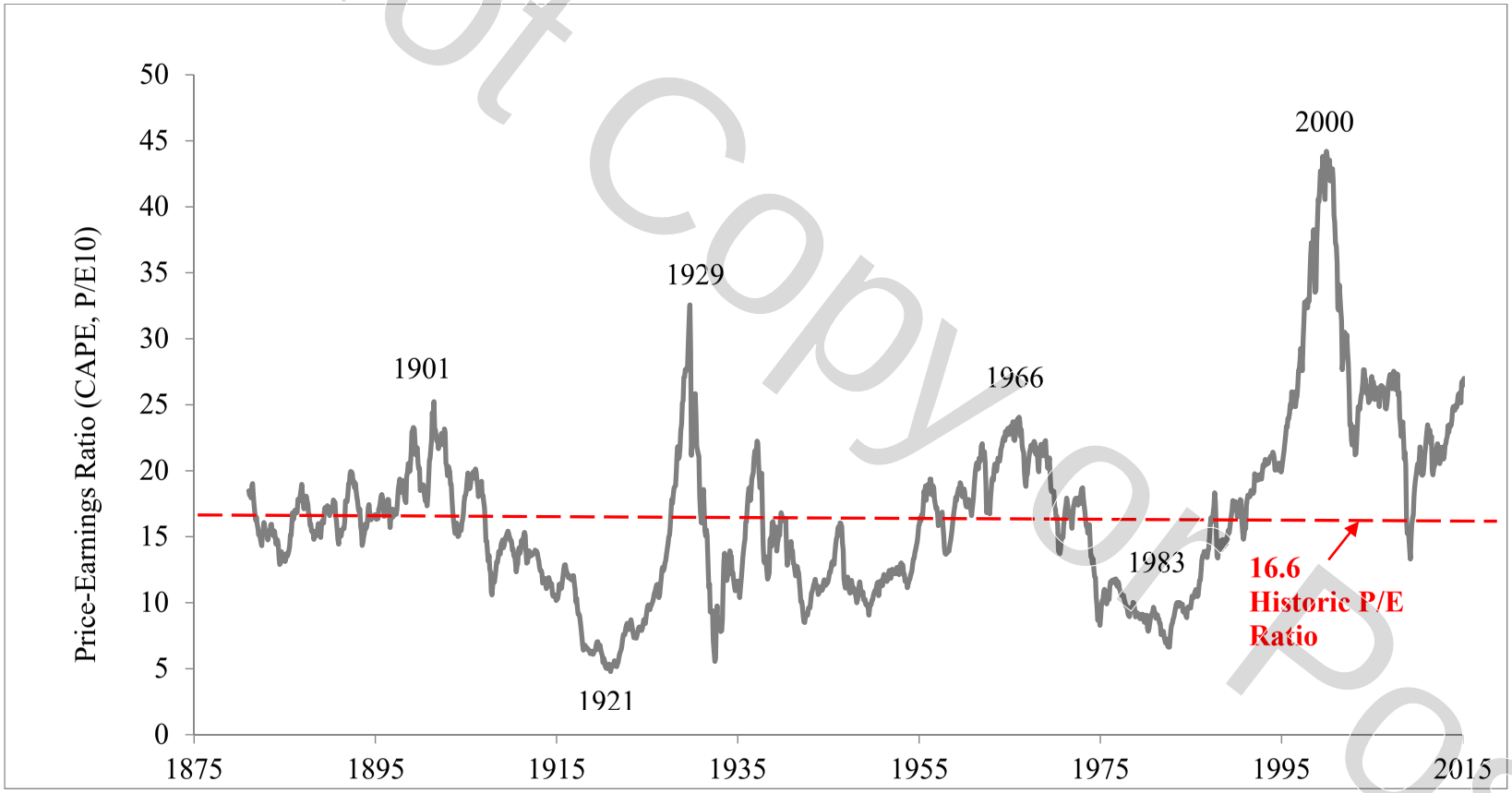
Stage	Annual ROR%	Typical Expected Holding Period (years)
Seed and startup	50%–100% or more	More than 10
First stage	40%–60%	5–10
Second stage	30%–40%	4–7
Expansion	20%–30%	3–5
Bridge and mezzanine	20%–30%	1–3
LBOs	30%–50%	3–5
Turnarounds	50%+	3–5

Data source: Jeffrey A. Timmons, *New Venture Creation,* 4th ed. (Chicago: Irwin, 1994), 512.

Exhibit 2

Valuing the Early-Stage Company

Price–Earnings Ratios for the S&P 500 Composite Stock Index: 1878–2015



Note: P/Es are based on cumulative average inflation-adjusted earnings from the previous 10 years.

Source: Robert Shiller, Yale University.

Exhibit 3

Valuing the Early-Stage Company

Market Valuation, Capital Commitments, and Investment Returns to Venture Capital Funds

	NASDAQ P/E Ratio	Capital Commitments ($ in millions)	Vintage Year Since Inception IRR (%)
1988	40.9	$4,209.7	18.9%
1989	36.5	4,918.8	19.2
1990	24.7	3,077.5	33.1
1991	18.0	1,900.3	27.9
1992	22.7	5,223.1	32.6
1993	23.0	4,489.2	46.7
1994	24.1	7,636.7	59.3
1995	20.3	9,387.3	88.5
1996	22.9	11,550.0	100.7
1997	26.7	17,741.9	91.8
1998	27.1	30,641.7	11.9
1999	35.6	53,420.2	-0 .6
2000	60.0	101,417.9	0.9
2001	33.7	38,923.4	3.0
2002	46.4	10,388.1	0.5
2003	31.1	9,144.7	9.3
2004	35.2	17,656.3	9.0
2005	22.2	30,071.9	8.0
2006	24.2	31,107.6	9.7
2007	24.5	29,401.0	17.6
2008	18.4	25,052.7	17.6
2009	19.5	16,122.0	20.6
2010	20.5	13,243.3	39.4
2011	16.7	18,962.3	30.3
2012	16.2	19,554.6	30.5
2013	18.7	16,765.7	9.1
Average	**27.3**	**20,461.8**	**28.3**
Median	**24.2**	**16,443.9**	**19.0**

Data source: P/E ratios for the NASDAQ Composite are from Datastream, and capital commitments to VC funds are from the 2014 National Venture Capital Association Yearbook. Vintage year since inception pooled IRRs are from Cambridge Associates U.S. Venture Capital Index and Selected Benchmark Statistics, 2014.